

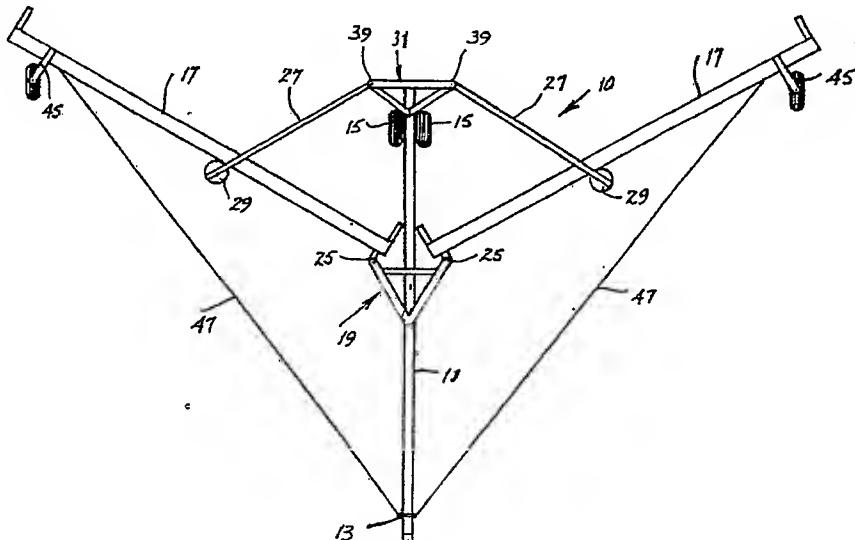
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(54) Title: FOLDING FRAME



(57) Abstract

A mobile frame for supporting ground working tools. The mobile frame comprises a longitudinal member (11) and two first pivotal boom sections (17) one to each side of the longitudinal member. A first pivot means (19) connects each first boom section (17) to the longitudinal member (11) for pivotal movement about a respective vertical axis between a first position in which each boom extends outwardly of the longitudinal member and a second position in which the boom sections are located substantially alongside the longitudinal member. The frame further comprises a pair of pivotal first support beams (27) one extending between each first boom section and the longitudinal member. Each support beam (27) and the respective first boom section (17) are interconnected for pivotal movement about a vertical axis. A second pivot means (31) connects the support beams (27) to the longitudinal member (11) for pivotal movement about respective vertical axes. A power device or other means is provided for effecting relative movement between the first pivot means and the second pivot means along the axis of the longitudinal member thereby to effect pivotal movement of the boom sections between the first and second positions.

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FOLDING FRAME

THIS INVENTION relates to a mobile frame.

It is common to mount ground working tools and other agricultural devices such as spray nozzles on mobile frames which can be propelled over the ground. The mobile frames generally include booms formed in sections which are movable between working and folded conditions.

The present invention seeks to provide a novel mobile frame construction with folding boom sections.

In one form the invention resides in a mobile frame comprising a longitudinal member, two first pivotal boom sections one to each side of the longitudinal member, a first pivot means connecting each first boom section to the longitudinal member for pivotal movement about a respective vertical axis between a first position in which each boom extends outwardly of the longitudinal member and a second position in which the boom sections are located substantially alongside the longitudinal member, a pair of pivotal first support beams one extending between each first boom section and the longitudinal member, each support beam and the respective first boom section being interconnected for pivotal movement about a vertical axis, second pivot means connecting the support beams to the longitudinal member for pivotal movement about respective vertical axes, and means for effecting relative movement between the first pivot means and the second pivot means along the axis of the longitudinal member thereby to effect pivotal movement of the boom sections between the first and second positions.

Preferably, each boom section is supported by at least one wheel. The wheel is preferably a castor wheel and is preferably located at or near the outer end of the boom section.

Preferably, the pivotal support beams are elevated with respect to the boom sections and the longitudinal member.

Preferably, a support cable extends between each boom section and a part of the longitudinal member forward of the boom sections. With this arrangement, the support cables stabilise the boom sections when the latter are in the first position.

In a preferred arrangement, said second pivot means is fixed to the longitudinal member and the first pivot means is slidably mounted on the longitudinal member for movement towards and away from the second pivot means thereby to effect movement of the boom sections between the first and second positions. A power device such as a hydraulic ram may be used for moving the first pivot means relative to the second pivot means.

The mobile frame may be provided with further boom sections to extend the working width thereof. In a preferred arrangement, the mobile frame may comprise two further boom sections one to each side of the longitudinal member for movement with the first boom section between the first and second positions, the first support beams each extending beyond the respective first boom sections and being pivotally connected to a respective one of the further boom sections for relative pivotal movement about a vertical axis, a pair of second support beams disposed outwardly of the first support beams and one to each side of the longitudinal member, each further support beam

being pivotally connected to the first boom section and the further boom section for pivotal movement about respective vertical axes.

Preferably, each further boom section is substantially parallel to the adjacent first boom section when in the first position.

The invention has been devised particularly, although not solely, for supporting elongated ground working tools of a construction disclosed in International Application No. PCT/AU87/00183. In such an application, each boom section supports the ends of one such tool.

The invention will be better understood by reference to the following description of two specific embodiments thereof as shown in the accompanying drawings in which:-

Figure 1 is a diagrammatic plan view of a mobile frame according to the first embodiment, with the frame being depicted in a first (working) position;

Figure 2 is a view similar to Figure 1 with the exception that the frame construction is depicted in a second (folded) position;

Figure 3 is a diagrammatic rear view of the mobile frame in the first position;

Figure 4 is a fragmentary schematic view illustrating part of the frame construction;

Figure 5 is a schematic side view of the longitudinal member of the mobile frame;

Figure 6 is a fragmentary plan view of the longitudinal member, showing the first pivot means for connecting the boom sections to the longitudinal member;

Figure 7 is a rear elevational view of the longitudinal member showing the second pivot means for connecting the

support beams to the longitudinal member; Figure 8 is a fragmentary side view showing the rear end of the longitudinal member;

Figure 9 is a diagrammatic plan view of a mobile frame according to the second embodiment, with the frame depicted in a first (working) position;

Figure 10 is a view similar to Figure 9 with the exception that the frame is depicted in a second (folded) position; and

Figure 11 is a schematic fragmentary view of part of the mobile frame of Figure 9.

The mobile frames according to the two embodiments are arranged to carry elongated ground working tools of the type disclosed in International Application No. PCT/AU87/00183. However, it will be understood that the frames may be arranged to carry any suitable ground working tools or other devices such as spray nozzles.

Referring now to Figures 1 to 8 of the drawings, the mobile frame according to the first embodiment is designated generally by reference numeral 10 and includes a longitudinal member 11 which provides a draw bar having a forward end 13 arranged for detachable connection to a towing vehicle (not shown) such as a tractor. The longitudinal member 11 is supported adjacent its trailing end on ground engaging wheels 15.

The mobile frame further comprises two boom sections 17 disposed one to each longitudinal member, as best seen in Figures 1 and 2 of the drawings. Each boom 17 is pivotally mounted at its inner end on the longitudinal member for pivotal movement between a first (working) position in which the boom section extends outwardly of the longitudinal member (as shown in Figure 1), and a

second (folded) position in which the boom section lies substantially alongside the longitudinal member (as shown in Figure 2).

A first pivot means 19 connects each boom section 17 at the inner end thereof to the longitudinal member. As best seen in Figure 6 of the drawings, the first pivot means 19 comprises a frame having a central element 21 which is slidably mounted on the longitudinal member 11 for movement therealong and a pair of lateral elements 23 which are supported on the central element 21. Each lateral element 23 includes a pivot point 25 to which a respective one of the boom sections 17 are pivotally connected at its inner end for pivotal movement about a substantially vertical axis between the first and second positions, as previously described.

A support beam 27 extends between the longitudinal member 11 and each boom section 17 (as best seen in Figure 1 of the drawings) and is elevated with respect to the longitudinal member and the boom section (as best seen in Figure 3). Each support beam 27 and the respective boom section 17 are interconnected at 29 for pivotal movement about a substantially vertical axis. More particularly each support beam 27 is connected at its outer end at 29 to the respective boom section 17 by way of a turntable 41 which is mounted on a support 43 fixed to and extending upwardly from the boom section. The upstanding support 43 accommodates the difference in elevation between the boom section and support beam and the turntable 41 accommodates pivotal movement therebetween.

A second pivot means 31 connects the support beams 27 at the inner ends thereof to the longitudinal member 11 for pivotal movement about respective vertical axes. The

second pivot means 31 is best seen in Figures 7 and 8 of the drawings and includes a post 33 at the trailing end of the longitudinal member 11. A transverse member 35 is mounted on the upper end of the post 33 and is braced by bracing elements 37 which extend between the outer ends of the transverse member 35 and the longitudinal member 11. At the extremities of the transverse member 35 there are provided pivot points 39 to which the inner ends of the support beams 27 are connected.

Movement of the boom sections between the first (working) and second (folded) positions is controlled by movement of the first pivot means 19 axially along the longitudinal member 11. While such movement of the first pivot means 19 axially along the longitudinal member 11 can be accomplished in any suitable manner, in this embodiment it is accomplished by means of a power device in the form of a hydraulic ram (not shown) operating between the first pivot means and the longitudinal member.

The boom sections 17 are supported at their outer ends by castor wheels 45.

A support cable 47 extends between the longitudinal member 11 and the outer end portion of each boom section 17, as shown in Figure 1 of the drawings. The support cables 47 serve to stabilise the boom sections when the boom sections are in the first (working) position.

Each boom section 17 is arranged to support a tool 48. The boom sections 17 are provided with a lift mechanism acting under the control of hydraulic rams 49 operable to lift the tool 48 clear of the ground to facilitate movement of the boom sections between the extended and folded positions.

Referring now to Figures 9, 10 and 11 of the drawings, the mobile frame according to the second embodiment is somewhat similar to that shown in the first embodiment, with the exception that there is a further boom section 50 provided on each side of the longitudinal member. For this reason, like numerals are used to designate corresponding parts in the two embodiments. In the second embodiment, the first support beams 27 each extend beyond the first boom sections 17 and are pivotally connected at 51 to a respective one of the further boom sections 50 for relative pivotal movement therebetween about a vertical axis. A pair of second support beams 53 are disposed outwardly of the first support beams 27 one to each side of the longitudinal member 11. Each further support beam 53 is pivotally connected to the respective first boom section 17 and the second boom section 50 about vertical axes at 55 and 57 respectively. The difference in elevation between each first support beam 27 and the respective boom section 50 is accommodated by a support 61 which carries a turntable 63 to provide for pivotal movement therebetween.

Each further boom section 51 is supported at its ends on castor wheels 59.

In the second embodiment, movement of the first pivot means along the longitudinal member 11 effects movement of the first boom sections and further boom sections between the first and second positions. In the second (folded) position, each further boom section 50 rests alongside the adjacent first boom section, as is illustrated in Figure 10 of the drawings.

It should be appreciated that the scope of the invention need not be limited to the scope of the two embodiments described. In particular, it should be appreciated that the mobile frame according to the invention may be arranged to carry agricultural tools or agricultural devices other than the tools mentioned herein.

THE CLAIMS defining the invention are as follows:-

1. A mobile frame comprising a longitudinal member, two first pivotal boom sections one to each side of the longitudinal member, a first pivot means connecting each first boom section to the longitudinal member for pivotal movement about a respective vertical axis between a first position in which each boom extends outwardly of the longitudinal member and a second position in which the boom sections are located substantially alongside the longitudinal member, a pair of pivotal first support beams one extending between each first boom section and the longitudinal member, each support beam and the respective first boom section being interconnected for pivotal movement about a vertical axis, second pivot means connecting the support beams to the longitudinal member for pivotal movement about respective vertical axes, and means for effecting relative movement between the first pivot means and the second pivot means along the axis of the longitudinal member thereby to effect pivotal movement of the boom sections between the first and second positions.
2. A mobile frame according to claim 1 wherein each boom section is supported by at least one wheel.
3. A mobile frame according to claim 2 wherein said wheel is located at or near the outer end of the boom section.
4. A mobile frame according to any one of the preceding claims wherein the pivotal support beams are elevated with respect to the boom sections and the longitudinal member.

5. A mobile frame according to claim 4 wherein each support beam and the respective first boom section are pivotally interconnected by means of a turntable rotatably mounted on the upper end of an upstanding support fixedly mounted on the boom section.

6. A mobile frame according to any one of the preceding claims wherein a support cable extends between each boom section and a part of the longitudinal member forward of the boom sections to stabilise the boom sections when the latter are in the first position.

7. A mobile frame according to any one of the preceding claims wherein said second pivot means is fixed to the longitudinal member and the first pivot means is slidably mounted on the longitudinal member for movement towards and away from the second pivot means thereby to effect movement of the boom sections between the first and second positions.

8. A mobile frame according to claim 7 further comprising a power device for moving the first pivot means relative to the second pivot means.

9. A mobile frame according to any one of the preceding claims further comprising two further boom sections one to each side of the longitudinal member for movement with the first boom section between the first and second positions, the first support beams each extending beyond the respective first boom sections and being pivotally connected to a respective one of the further boom sections for relative pivotal movement about a vertical axis, a pair of second support beams disposed outwardly of the first support beams and one to each side of the longitudinal member, each further support beam being

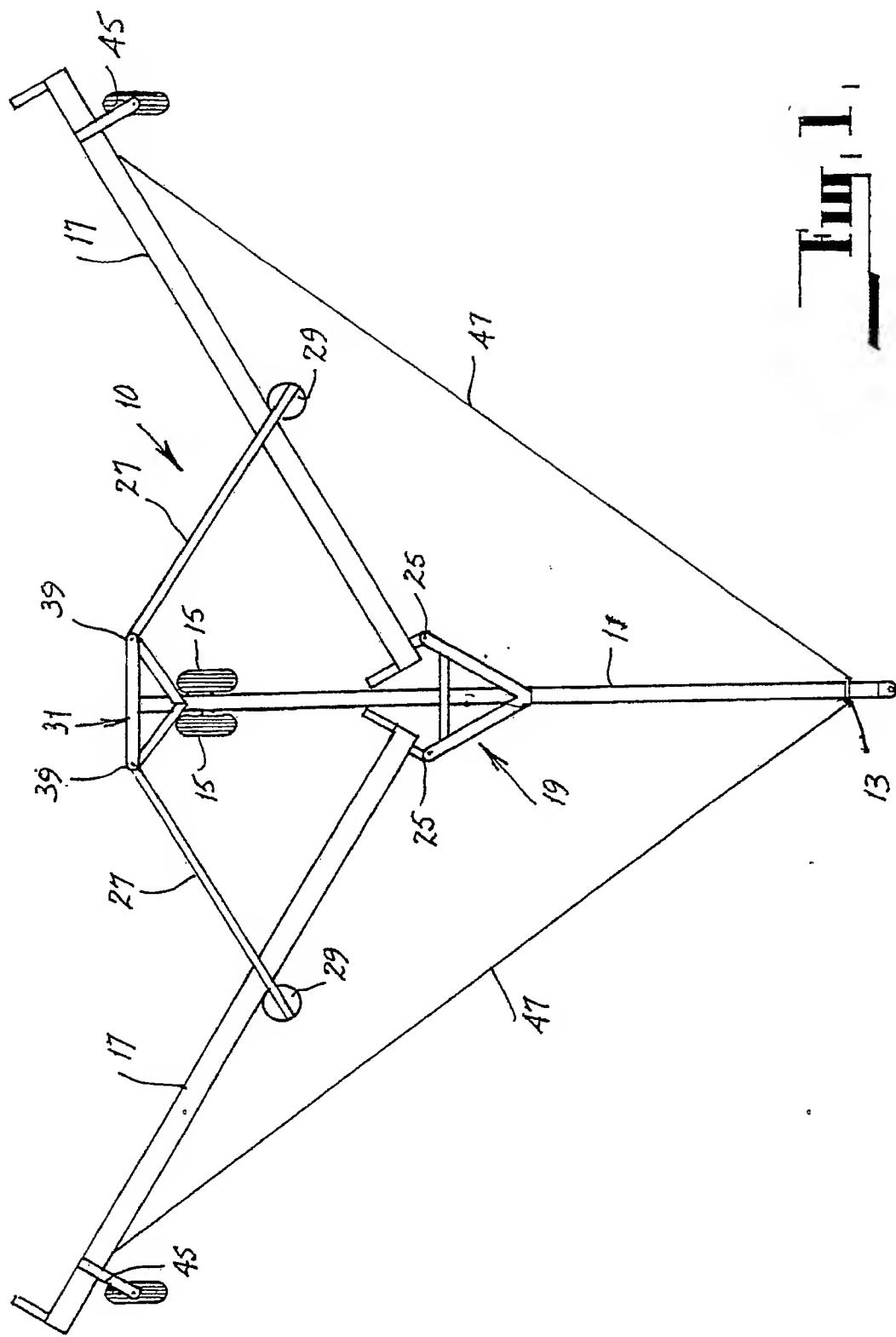
pivottally connected to the first boom section and the further boom section for pivotal movement about respective vertical axes.

10. A mobile frame according to claim 9 wherein each first support beam is pivotally connected to a respective one of the further boom sections by means of a turntable rotatably mounted on the upper end of an upstanding support fixed onto the further boom section.

11. A mobile frame according to claim 9 or 10 wherein each further boom section is substantially parallel to the adjacent first boom section when in the first position.

12. A mobile frame substantially as herein described with reference to Figures 1 to 8 of the drawings.

13. A mobile frame substantially as herein described with reference to Figures 9, 10 and 11 of the drawings.



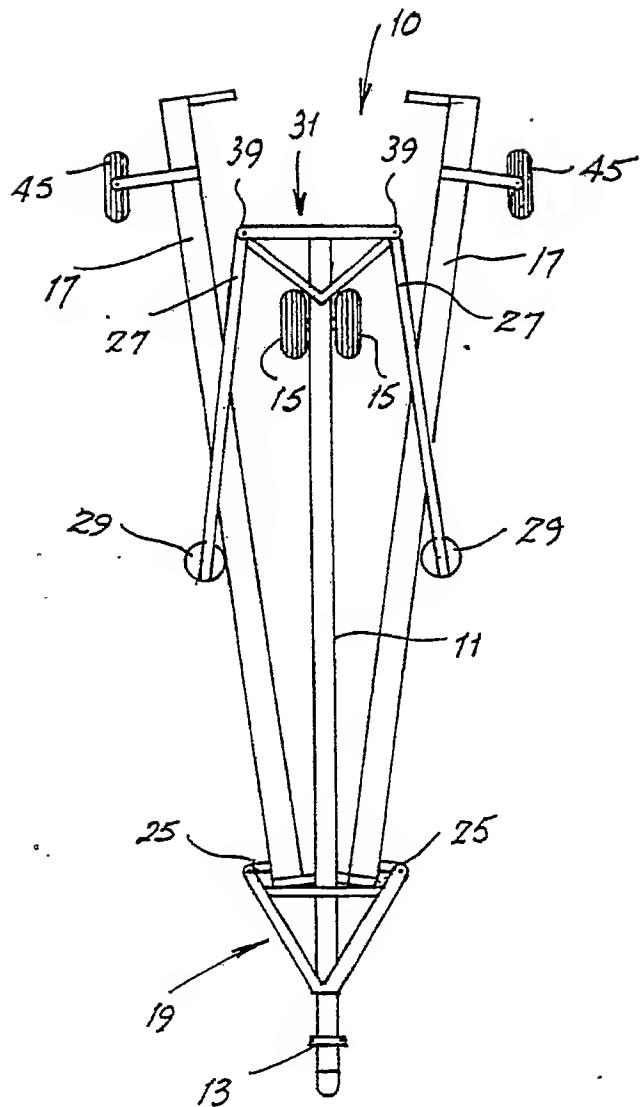


FIG. 2.

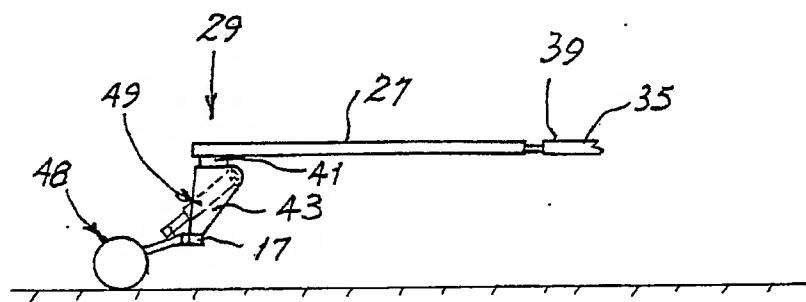
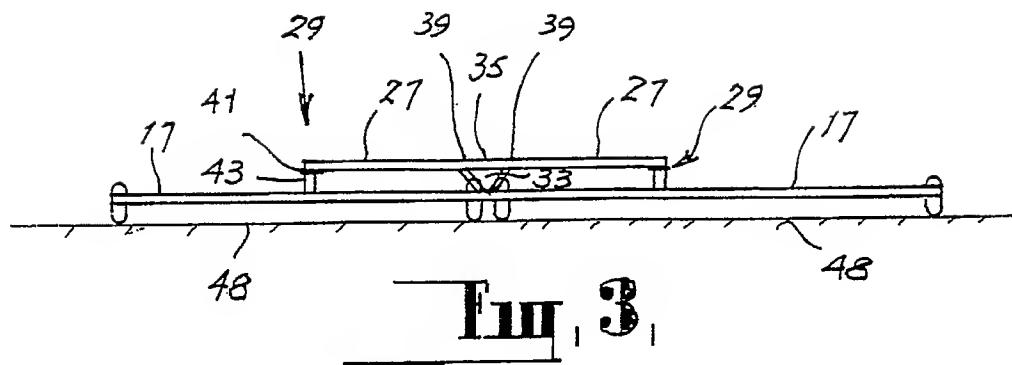


Fig. 4.

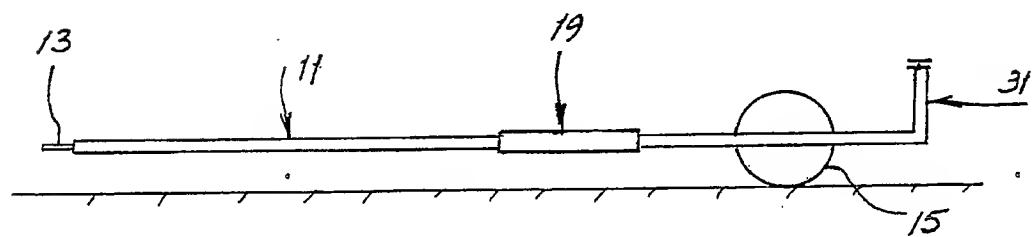
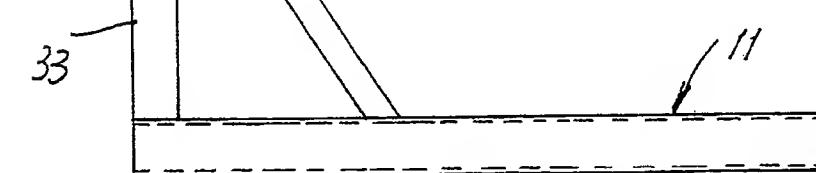
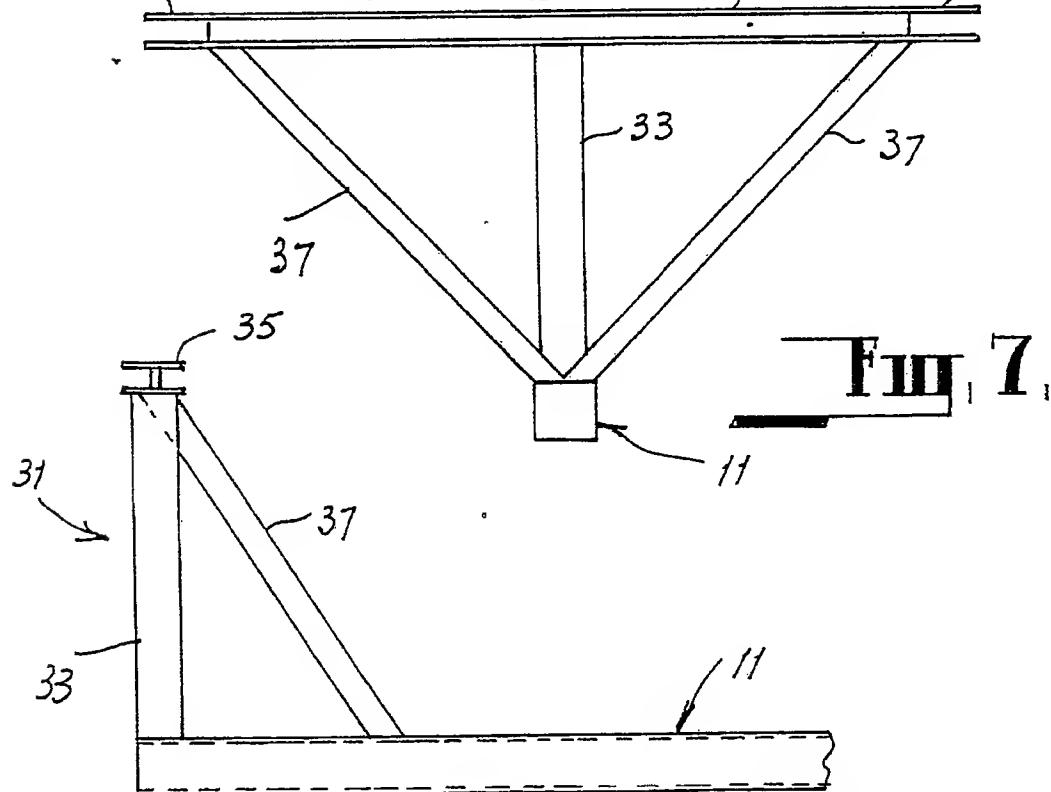
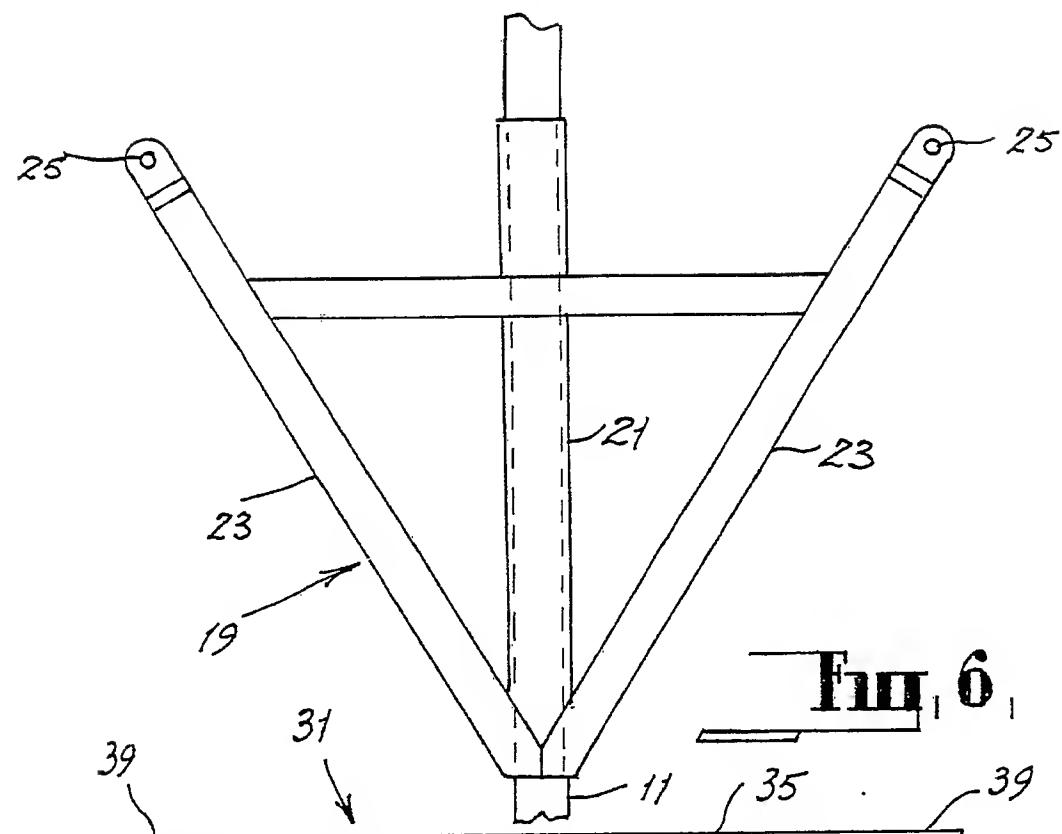
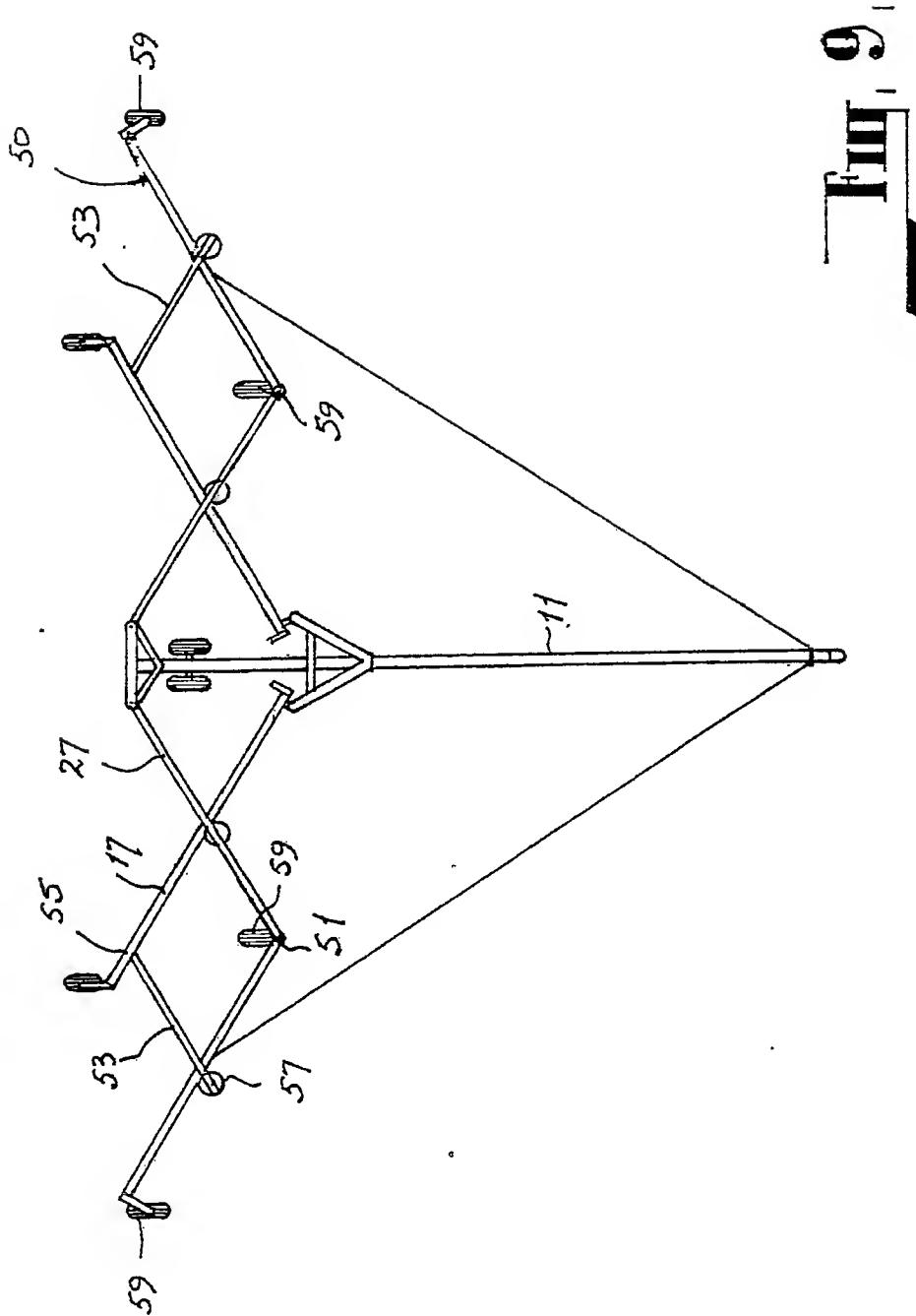


Fig. 5.





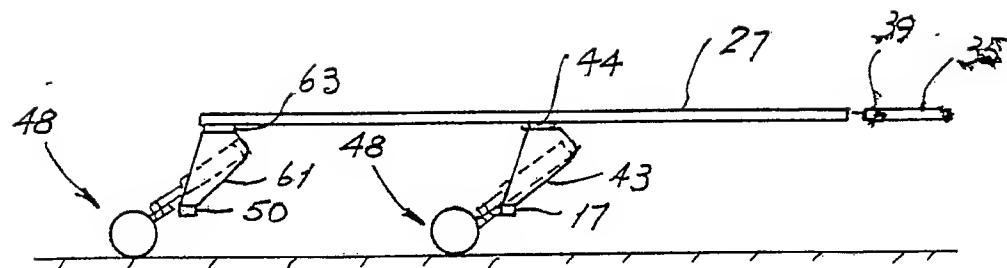


Fig. 11.

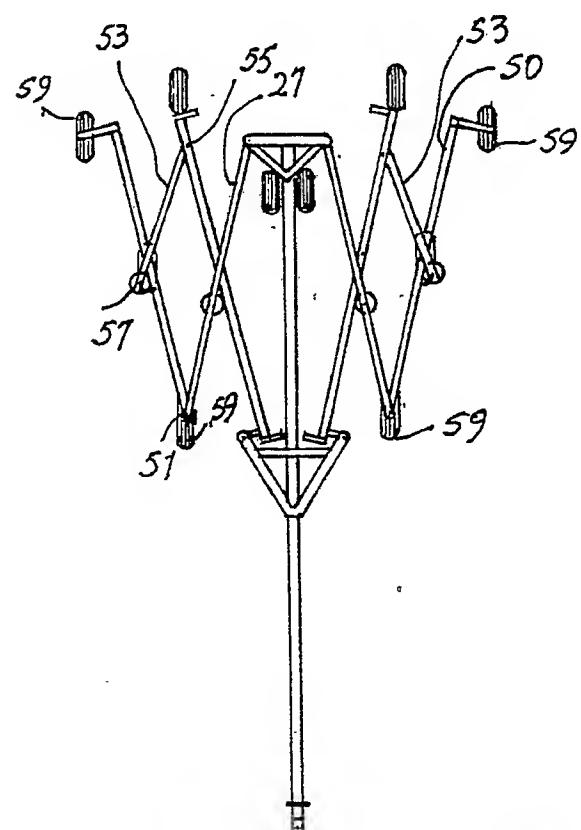


Fig. 10.

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.⁴ A01B 73/06**II. FIELDS SEARCHED**

Classification System	Minimum Documentation Searched *
	Classification Symbols
IPC	A01B 73/06, 73/00, 15/14, 23/04

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are included in the Fields Searched *

AU : IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Category **	Citation of Document. *** with indication, where appropriate, of the relevant passages ****	Relevant to Claim No. *****
X,Y	AU,B, 36042/84 (561227) (DEERE AND COMPANY) 4 July 1985 (04.07.85)	(1,2,3,7,8)
X,Y	AU,A, 31815/84 (DEERE AND COMPANY) 27 March 1986 (27.03.86)	(1,2,3,7,8,12)
X,Y	AU,A, 22566/83 (DEERE AND COMPANY) 5 July 1984 (05.07.84)	(1,2,3,7,8)
X,Y	AU,A, 16780/76 (HOLLAND) 9 March 1978 (09.03.78)	(1,2,3,7,8)
X,Y	AU,B, 39167/72 (456215) (FOUR FARMERS ENGINEERING PTY LTD) 29 August 1973 (29.08.73)	(1,4,7,8)
Y	AU,B, 41980/64 (282278) (KUPKE) 8 September 1966 (08.09.66)	(1-6)

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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "G" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

11 December 1987 (11.12.87)

Date of Mailing of this International Search Report

(21.12.87) 21 DECEMBER 1987

International Searching Authority

Australian Patent Office

Signature of Authorized Officer

R. KIRBY

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 87/00290

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members					
AU	36042/84	BR	8406637	EP	147832	ES	539040
		ES	8606969	US	4582143	ZA	8409987
AU	31815/84	BR	8404567	DK	4395/84	EP	135180
		ES	535929	ES	8605933	US	4504076
		ZA	8407228				
AU	22566/83	CA	1217682	EP	114983	ES	528399
		ES	8500001	US	4596290	ZA	8308999

END OF ANNEX